RSS SESSION SIGN-IN SHEET
Pediatric Care Echo Series
Caring for Children with Concussions
May 17, 2018
Peter Ferrazzano, MD and Lynne Sears, NP

RSS Global Objective(s): Assess pediatric trauma given the new skills and guidelines determined to be safe for children. Identify proper tools and standardized measurement practices to improve diagnosis and treatment of pediatric patients.

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<td>Lynne Sears, NP</td>
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Caring for Children with Concussion

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Division of Pediatric Critical Care Medicine
University of Wisconsin School of Medicine and Public Health
Director, Pediatric Brain Care Clinic

Lynne Sears, BSN, MSN, CPNP
Pediatric Critical Care Nurse Practitioner
Coordinator, Pediatric Brain Care Clinic
We have no disclosures.
Peter and Lynne
In a heartbeat……The call……
…… “Dad, I hit a patch of ice”……

- 16 year old boy, licensed for 3 months, no premorbid history
- Country road, curve, at night, rolled the car
- Seatbelt on, Air bags deployed
- Brief loss of consciousness, self extricated
- Perseverating when EMS arrived, no visible injury
- Collared and boarded, to the ED
Level II Trauma Activation at UWHC

- Evaluated in the Emergency room
- Head CT negative
- Spines cleared
- Admitted for observation
- Discharged the next day after OT, PT, rehab evaluations
- Family provided anticipatory guidance and education on TBI and returning to activities
- Follow-up at the Brain Care Clinic (BCC) in 2 weeks
Traumatic Brain Injury

- Defined by the CDC as a blunt or penetrating injury to the head resulting in any of the following: *decreased level of consciousness, amnesia, neurologic deficits, neuropsychologic abnormality, or intracranial lesion*.

- Leading cause of death and disability in children\(^1\)
  - TBI’s contribute to ~ 30% of all injury deaths
  - 153 people a DAY die from injuries that include a TBI
Traumatic Brain Injury

- TBI severity is commonly stratified based on GCS into severe (GCS ≤ 8), moderate (GCS 9-12), and mild (GCS ≥ 13)\(^2\)

- Mild injuries can be further classified as complicated or uncomplicated based on presence or absence of an intracranial lesion or displaced skull fracture.

<table>
<thead>
<tr>
<th>Eye Opening Response</th>
<th>Verbal Response</th>
<th>Motor Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; 2 yrs old, Spontaneous</td>
<td>&gt; 2 yrs old, Oriented</td>
<td>&gt; 2 yrs old, Spontaneous</td>
</tr>
<tr>
<td>&lt; 2 yrs old, Spontaneous</td>
<td>&lt; 2 yrs old, Coos/babble</td>
<td>&lt; 2 yrs old, Spontaneous</td>
</tr>
<tr>
<td>To voice, 3</td>
<td>To voice, Confused</td>
<td>Localizes to pain, 5</td>
</tr>
<tr>
<td>To pain, 2</td>
<td>To pain, Inappropriate words</td>
<td>Withdraws from pain, 4</td>
</tr>
<tr>
<td>None, 1</td>
<td>Incomprehensible sounds</td>
<td>Extensor posturing, 2</td>
</tr>
</tbody>
</table>

Total GCS = 3-15
What is a Concussion?

- Often used to describe a TBI that occurs in sports
- Usually on the mild end of the spectrum of TBI
- We prefer the term mild TBI
  - Direct blow to head or transmission of force from bodily impact to the brain
  - Rapid onset of neurologic impairment
  - Functional impairment, usually with no structural brain injury
Causes of Mild TBI

Cause of injury in patients evaluated in the Pediatric Brain Care Clinic at the University of Wisconsin Waisman Center
Care of a Child with Suspected TBI
Prevent Secondary Injury\textsuperscript{3,4}

- **Airway:**
  - Open and maintain, may need intubation
  - Jaw thrust, not head tilt

- **Breathing**
  - Provide supplemental oxygen, prevent hypoxemia
  - Do not hyperventilate

- **Circulation**
  - Goal is normotensive, prevent hypotensive
  - Fluid bolus

- **Check blood sugar, keep warm and keep calm**
Identification and initial management of Mild TBI

- May occur in absence of obvious head trauma by transmission of biomechanical forces from body to brain
- Signs of mild-TBI: LOC, confusion, balance impairment
- Avoid additional injury: remove from sports play or dangerous environment
- Urgent medical evaluation:
  - Neurologic assessment
  - Identify other causes of altered mental status
  - CT scan if severe mechanism of injury, abnormal neuro exam, GCS≤14, or palpable skull fracture (PECARN Guidelines, *Lancet* 2009; 374: 1160–70)
Common Symptoms after mild TBI

<table>
<thead>
<tr>
<th>PHYSICAL</th>
<th>COGNITIVE</th>
<th>EMOTIONAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headaches</td>
<td>Feeling in a “fog”</td>
<td>Irritability</td>
</tr>
<tr>
<td>Dizziness</td>
<td>Cognitive slowing</td>
<td>Sadness</td>
</tr>
<tr>
<td>Balance problems</td>
<td>Poor concentration</td>
<td>Increased nervousness</td>
</tr>
<tr>
<td>Nausea/Vomiting</td>
<td>Easily distracted</td>
<td>Feeling more emotional</td>
</tr>
<tr>
<td>Fatigue or drowsiness</td>
<td>Memory problems</td>
<td>Short fuse/temper</td>
</tr>
<tr>
<td>Change in appetite</td>
<td>Trouble problem-solving</td>
<td>Personality changes</td>
</tr>
<tr>
<td>Change in sleep</td>
<td>Short term memory</td>
<td>Apathy</td>
</tr>
<tr>
<td>Sensitivity to light or noise</td>
<td></td>
<td>Decreased motivation</td>
</tr>
<tr>
<td>Numbness or tingling</td>
<td></td>
<td>Lack of awareness</td>
</tr>
</tbody>
</table>

Severity of initial symptoms correlates with duration of symptoms
Pediatric Brain Care Clinic
Waisman Center

- Interdisciplinary clinic for infants, children, and adolescents with, or at risk for, developmental and/or behavioral disabilities associated with an acquired brain injury

- Goals of the BCC
  - Early recognition and treatment of behavioral, development or learning deficits from a brain injury
  - Symptom management of post-concussion headaches
  - Provide counseling regarding subsequent brain injuries
  - Use a multidisciplinary team to meet each child’s needs
  - Facilitate access to community resources and services
  - Support and advocate for the patient and family
Pediatric Brain Care Clinic
Waisman Center

- Clinic evaluations include a physical exam, neurologic assessment, and neuropsychologic testing
  - IMPACT computer based testing for >10
  - Neurocognitive “mini-battery” for children 4-10
  - Bayley’s Scales of Infant Development for children <4
Pediatric Brain Care Clinic
Meet the Team

Peter Ferrazzano, MD
Clinic Director
Critical Care

Lynne Sears, CPCP
Clinic Coordinator
Nurse Practitioner

Alanna Kessler-Jones PsyD
Pediatric Neuropsychologist

Karen Carpenter
Certified Rehab Counselor

Cassie Meffert, PA
Pediatric Neurology
## Return-To-Learn

<table>
<thead>
<tr>
<th>STAGE</th>
<th>ACTIVITY</th>
<th>OBJECTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Activity</td>
<td>Complete cognitive rest – no school, homework, reading, texting, video games, or computers</td>
<td>Recovery</td>
</tr>
<tr>
<td>“Brain Rest”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Begins during hospitalization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gradual re-introduction of cognitive activity</td>
<td>Relax previous restrictions on activities and add back for short periods of time (5-15 minutes)</td>
<td>Gradual controlled increase in sub-symptom threshold cognitive activities</td>
</tr>
<tr>
<td>Homework at home</td>
<td>Homework in longer increments (20-30 minutes)</td>
<td>Increase cognitive stamina by repetition of short periods of self-paced cognitive activity</td>
</tr>
<tr>
<td>School Re-entry</td>
<td>Part day of school after tolerating 1-2 cumulative hours of homework at home</td>
<td>Re-entry into school with accommodations</td>
</tr>
<tr>
<td>Gradual re-integration into school</td>
<td>Increase to full day of school</td>
<td>Accommodations decrease as cognitive stamina improves</td>
</tr>
<tr>
<td>Resumption of full cognitive workload</td>
<td>Introduce testing, catch up with essential work</td>
<td>Full return to school</td>
</tr>
</tbody>
</table>

If increase in cognitive activity worsens symptoms, cut back to previously tolerated activity level for 24-48 hours and then resume gradual increase.
## Post-Concussion Scale, Lovell and Collins 1998

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Score Range</th>
<th>Symptom</th>
<th>Score Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Headache</td>
<td>0-6</td>
<td>Sensitivity to light</td>
<td>0-6</td>
</tr>
<tr>
<td>Balance problems</td>
<td>0-6</td>
<td>Sadness</td>
<td>0-6</td>
</tr>
<tr>
<td>Trouble falling asleep</td>
<td>0-6</td>
<td>Numbness/tingling</td>
<td>0-6</td>
</tr>
<tr>
<td>Drowsiness</td>
<td>0-6</td>
<td>Difficulty concentrating</td>
<td>0-6</td>
</tr>
<tr>
<td>Irritability</td>
<td>0-6</td>
<td>Vomiting</td>
<td>0-6</td>
</tr>
<tr>
<td>Feeling more emotional</td>
<td>0-6</td>
<td>Fatigue</td>
<td>0-6</td>
</tr>
<tr>
<td>Feeling mentally foggy</td>
<td>0-6</td>
<td>Sleeping less than usual</td>
<td>0-6</td>
</tr>
<tr>
<td>Visual problems</td>
<td>0-6</td>
<td>Sensitivity to noise</td>
<td>0-6</td>
</tr>
<tr>
<td>Nausea</td>
<td>0-6</td>
<td>Nervousness</td>
<td>0-6</td>
</tr>
<tr>
<td>Dizziness</td>
<td>0-6</td>
<td>Feeling slowed down</td>
<td>0-6</td>
</tr>
<tr>
<td>Sleeping more than usual</td>
<td>0-6</td>
<td>Difficulty remembering</td>
<td>0-6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td></td>
<td></td>
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</table>
Recovering from mild TBI

- Gradual recovery is expected over the course of 2-4 weeks
- Sub-symptomatic light physical activity may improve recovery
- Return to full physical activity / competitive sports should not precede return to full cognitive activity

Factors Associated with Slower Recovery

<table>
<thead>
<tr>
<th>Loss of consciousness</th>
<th>Presence of mild bleed or skull fracture</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of ADHD, depression, anxiety</td>
<td>History of learning or behavior disorder</td>
</tr>
<tr>
<td>Lower level of premorbid functioning</td>
<td>History of headaches or migraines</td>
</tr>
<tr>
<td>History of developmental delays</td>
<td>History of one or more concussions</td>
</tr>
<tr>
<td>Family psychiatric history</td>
<td>Family history of learning disabilities</td>
</tr>
<tr>
<td>Familial instability</td>
<td>Lower socioeconomic status</td>
</tr>
</tbody>
</table>
School Accommodations after TBI

- Breaks as needed in a quiet place
- Preprinted class notes
- Additional time for assignments
- Excuse non-essential work
- Avoid double workload of make-up plus new work
- Additional help and tutoring as needed
- No testing until tolerating full day of school
- First testing untimed
Our experience with children with mild TBI

Patient and injury characteristics in children evaluated in the Pediatric Brain Care Clinic after a mild TBI
Our experience with children with mild TBI

Clinical evaluations and return to activity recommendations in children evaluated in the Pediatric Brain Care Clinic after a mild TBI.
Back to our patient......

...... Two weeks since crash

- Had been going to school full days but needs frequent breaks
- Complains of daily headaches
  - Triggered by math class and band practice
- Complains of difficulty falling and staying asleep
- Complains of extreme fatigue, naps everyday after school
- Physical/neuro exam normal
Neuropsych Testing Results

- Symptom Severity Score is 26
  - Headaches, feeling mentally foggy, difficulty concentrating, fatigue, feeling slowed down and difficulty remembering.

- ImPACT
  - Demonstrated slowed processing speed and reaction time
  - Low memory scores
Our Recommendations

- Return to school half days, increase as symptoms decrease
  - No band class
- School accommodations
- Limit after school napping to 20-30 minutes only
- Encourage physical activity like walking
- Discussed “Sleep Hygiene” and recommended melatonin
- Return to BCC in 2 weeks, where he was much improved.
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1. Traumatic Brain Injury & Concussion, Centers for Disease Control and Prevention, April 27, 2017


Additional Resources

- CDC “HEADS UP” Website: https://www.cdc.gov/HeadsUp/
  - Concussion assessment tools, patient information, etc

  - Guidelines for evaluation and management of sports-related concussion
  - Concussion Recognition Tool (CRT5)
  - Sport Concussion Assessment Tool (SCAT5 and Child SCAT5)
THANK YOU

Questions?